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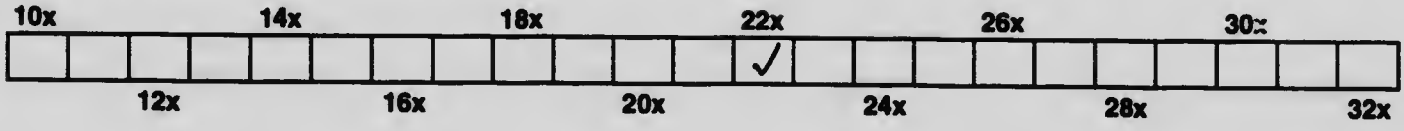

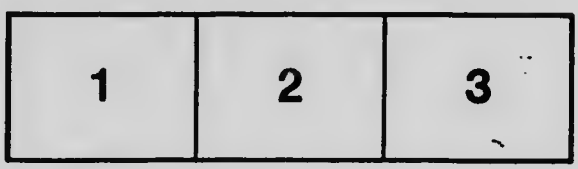

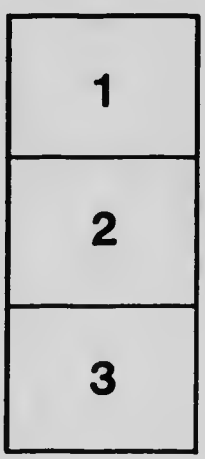

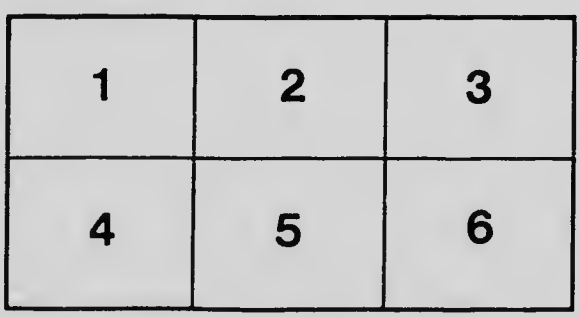

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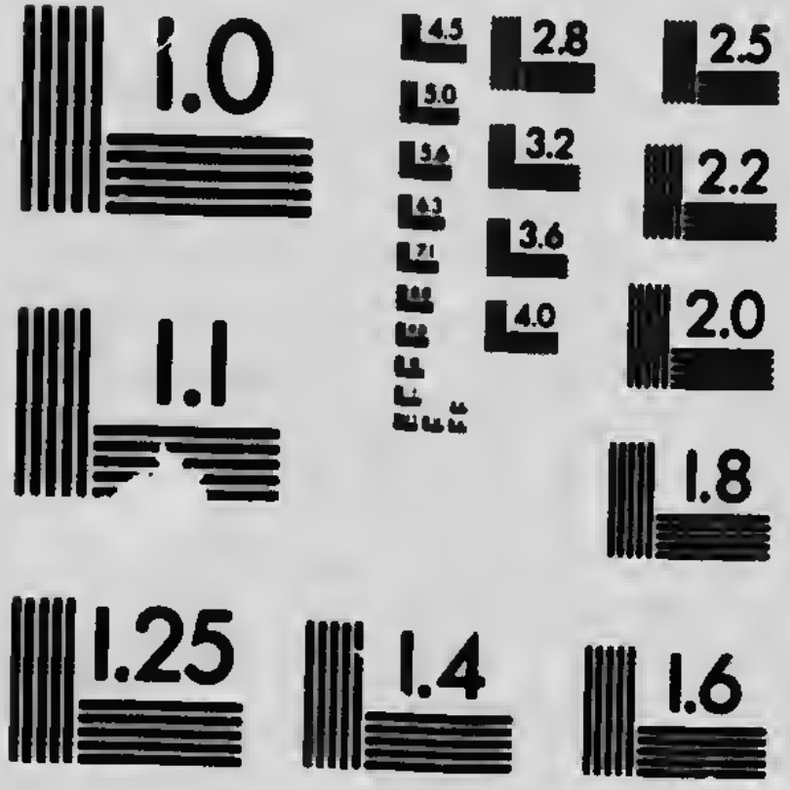

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BULLETIN 206.] NOVEMBER, 1912.

Ontario Department of Agriculture.

ONTARIO AGRICULTURAL COLLEGE

DAIRY SCHOOL BULLETIN

Part II.

Dairying on the Farm

NOTE.—The Department has thought it well to issue two bulletins to follow Dairy School Bulletin, No. 172, issued in May, 1909, the supply of which is exhausted. Part I. of the new issue will be found of special value to manufacturers of butter and cheese in factories, while Part II. is intended for the farmer and his family. Part I. may be secured by farmers by applying to the Department of Agriculture, Toronto.

INTRODUCTION.

BY H. H. DEAN, B.S.A., PROFESSOR OF DAIRY HUSBANDRY.

DAIRY FARMER. The past winter has been one of exceptionally high prices for all kinds of dairy products. The cow is undoubtedly the best paying animal on the farm if she is fed and handled properly. However, in order to make a cow pay it is necessary that her owner shall possess certain qualifications. The most important of all is that he or she shall have a real liking for cows—not only because of the money which they earn, but he or she must like them simply because they are cows. A person who really likes cows will take pleasure in feeding and looking after them. To him or her it is not drudgery. This person will always

treat cows kindly and considerately. There will always be a bond of sympathy between the owner and the cow. Each will strive to do the best possible for the other.

The owner of cows must study their habits, likes and dislikes. He or she must feed them liberally and make them as comfortable as possible.

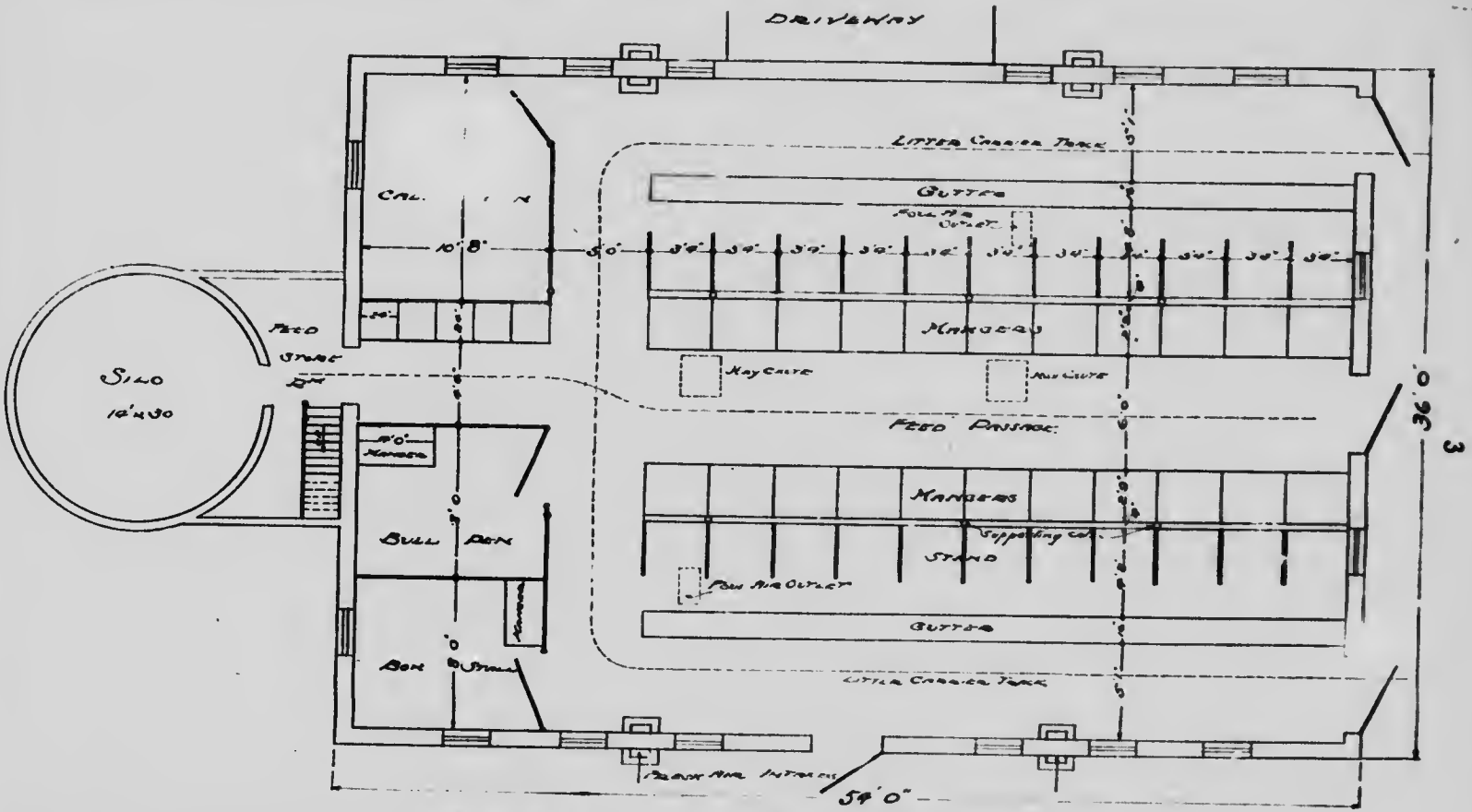
Unless he or she is prepared to be a student of cows, success is not probable. To the dairy farmer we should say, know your cows individually. This can be best done by weighing the milk from each cow daily, once a week, on two consecutive days each month, or even once a month. Samples for testing should also be taken on the day or days for weighing in order to know the percentage of fat in the milk. This, together with a close observation of the feed consumed by a cow, will enable a dairy farmer to determine whether or not his cows are making a profit. It will also enable him to intelligently weed the poorer cows.

Dairy Cows may be purchased or they may be bred. Frequently good cows may be bought at reasonable prices, but generally speaking they must be reared by the dairy farmer. For the dairyman who cannot afford to keep pure-bred cows, it is desirable to select grade or native cows and breed these to a pure bred male belonging to one of the dairy breeds. Do not cross breeds. Select one and stick to it. Great attention should be paid to the sire, as milking quality in the female depends more on the sire than on the dam. Dairy farmers do not sufficiently realize the importance of this point. Excellent dairy cows may be secured at small cost by using a dairy sire belonging to a dairy breed and a dairy family. In this way a herd of ordinary or inferior breeding may soon be transformed into a herd of good milkers. The fundamental mistake made by many breeders of dairy cows is in the use of inferior or what are commonly called "scrub" sires. The patrons of every cheese factory and creamery ought to have the use of a pure-bred bull at nominal cost. It would pay the factories to adopt some co-operative plan to secure this result.

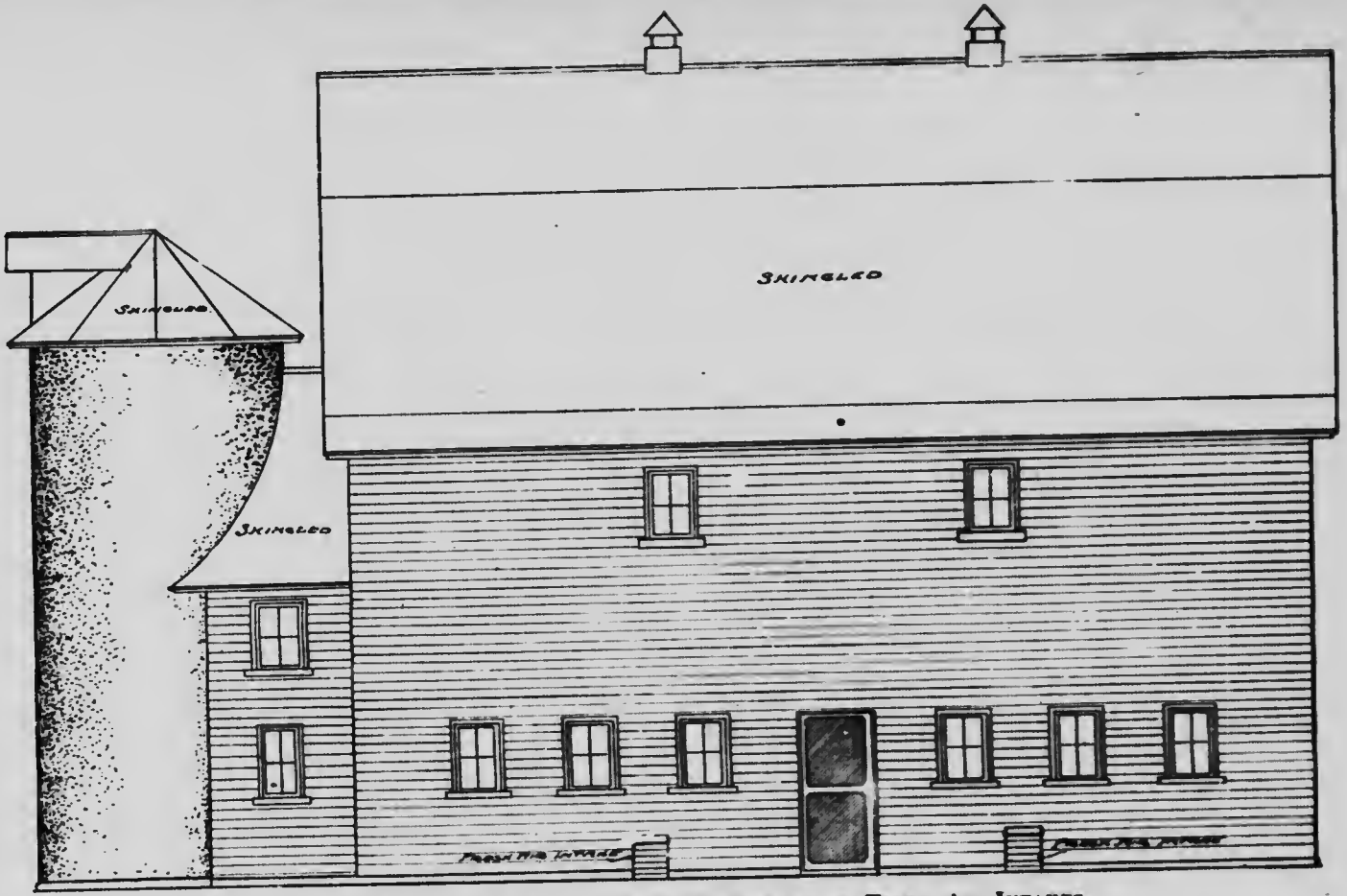
Calves and heifers for the dairy should be kept in a thrifty condition but not too fat. The should commence milking when about two and one-half years old. At the end of the second lactation period and during all future years they should produce not less than 6,000 lbs. of milk or 250 lbs. butter yearly. This may be taken as a minimum standard of production for profitable dairy cows. Stated another way, they should earn from $25 to $100 per cow each year, above the cost of feed.

Dairy Stables. The chief requirements of a dairy stable are that it shall be light, clean, and healthful. The first is got by having plenty of clean windows, the second by having cement floors, with stalls of proper length and a gutter or drop behind the cows, and the last by having the stable well ventilated, and whitewashed at least once a year.

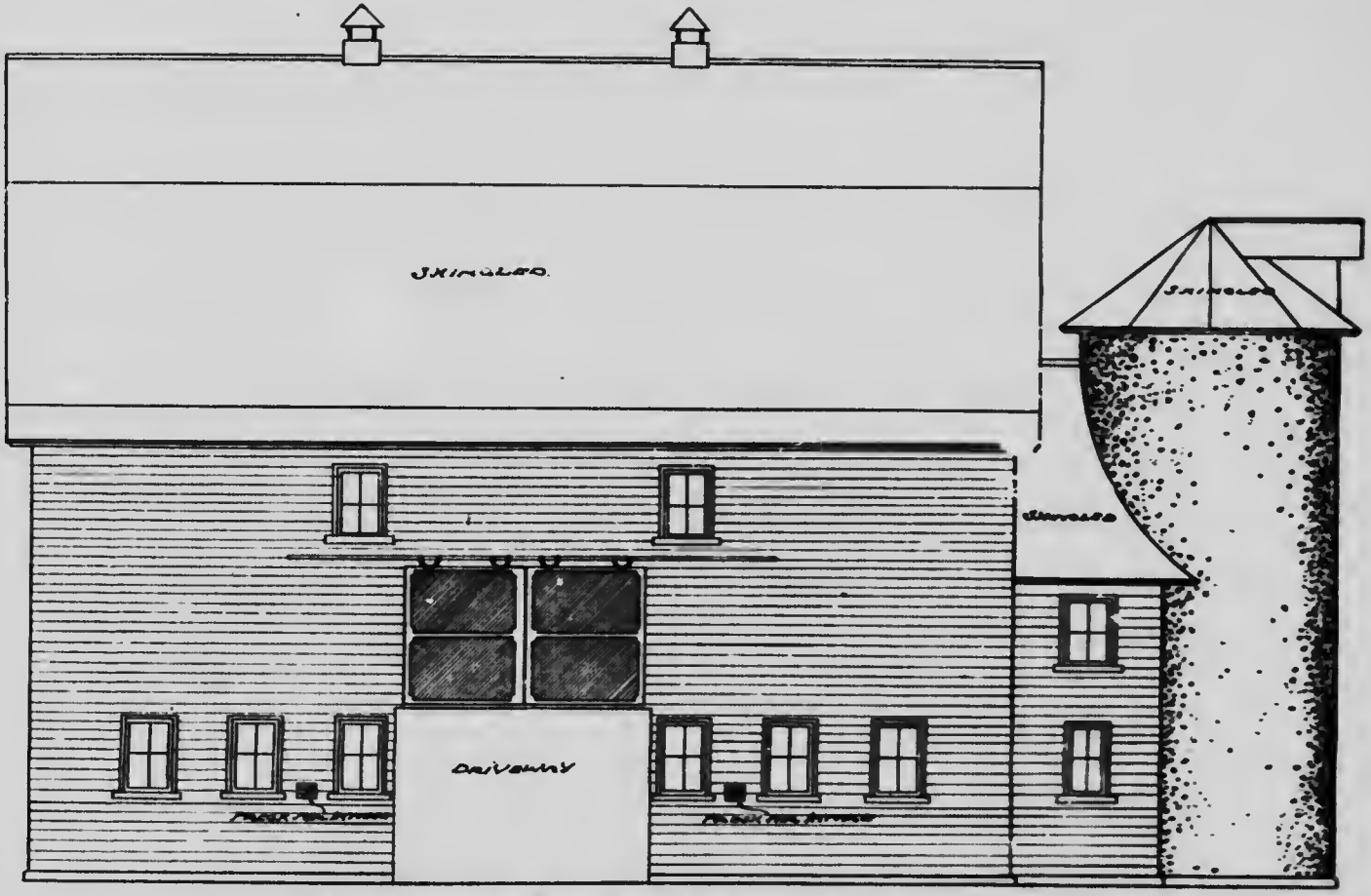
The following illustrations of a modern dairy barn are self-explanatory. The two systems of ventilation in general use—the "King" and "Rutherford"—are illustrated.



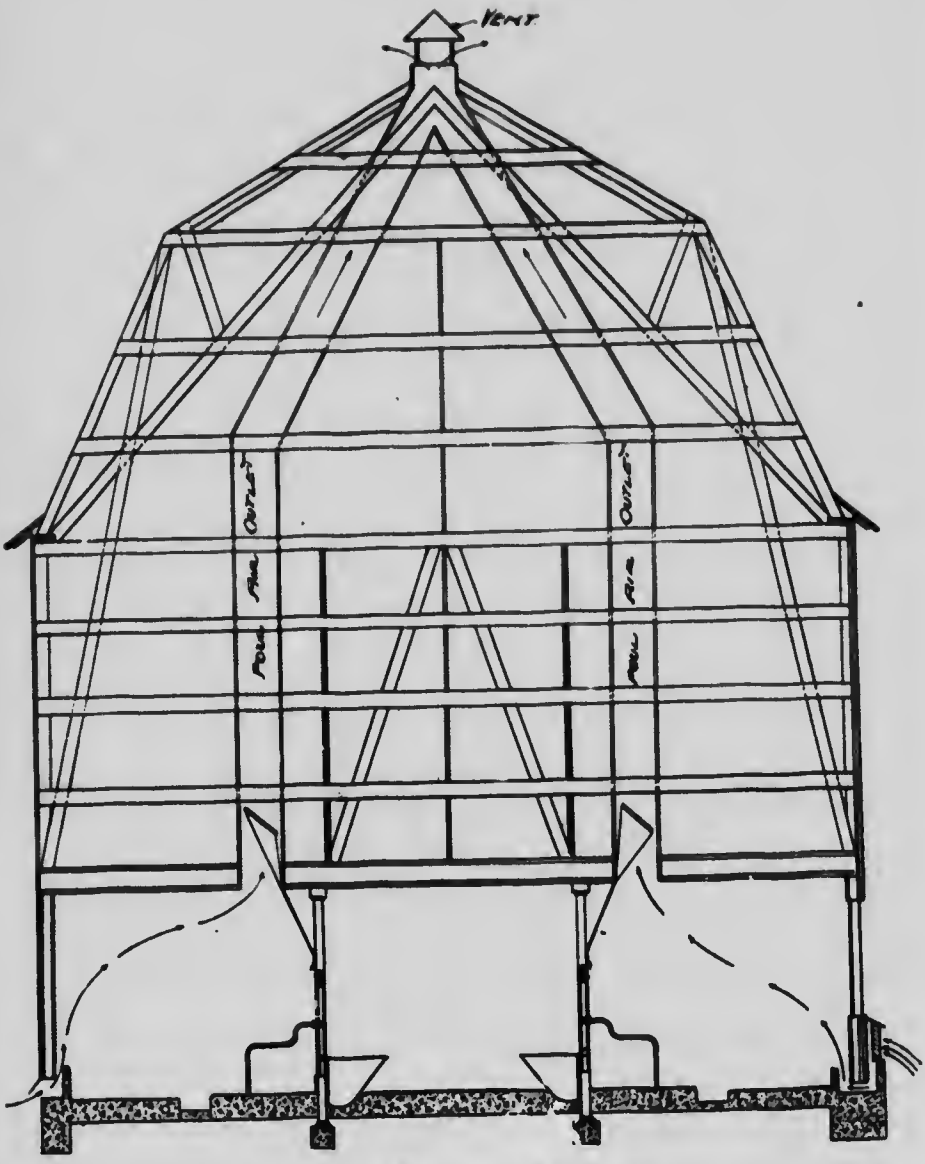
GROUND FLOOR PLAN OF A MODERN DAIRY BARN.



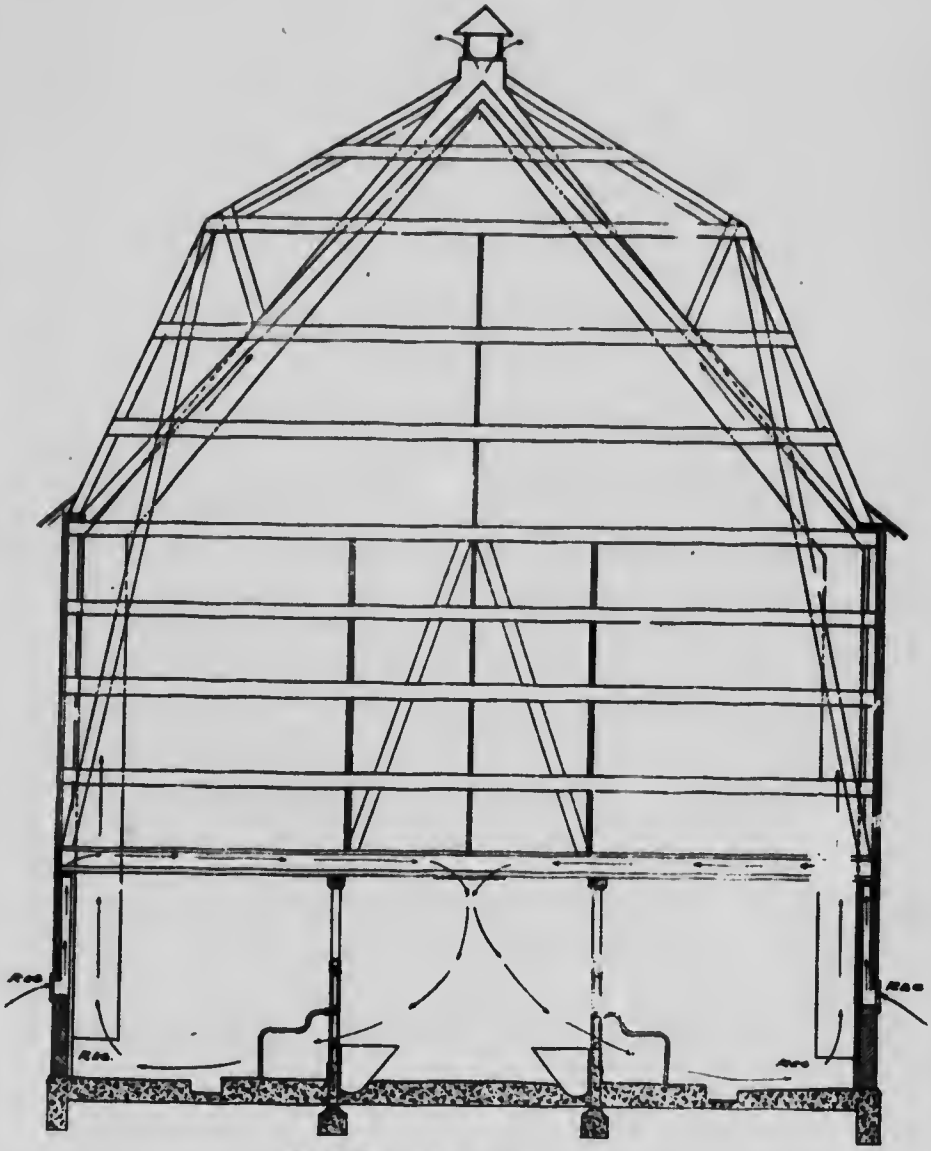
SIDE ELEVATION, SHOWING RUTHERFORD SYSTEM OF FRESH AIR INTAKES.



SIDE ELEVATION, SHOWING KING SYSTEM OF FRESH AIR INTAKES.



RUTHERFORD SYSTEM OF VENTILATION.



King System of Ventilation.

SUMMER FEEDING. Cows are expected to, and should give the best returns of the year while on good pasture. Grass is their natural food. They should not be turned out too soon in the spring, however, especially if milking heavy, as the young grass does not contain enough nutrients to keep up the milk flow. Fall grain pastures are very similar in this respect. There is also danger of giving the milk an undesirable flavor.

Special provision should be made for feed during the summer when the ordinary pastures become dried up. An excellent mixture for this is that recommended by Professor C. A. Zavitz, viz., 57 lbs. of oats, 30 lbs. early amber sugar cane, and 7 lbs. red clover, a total of 88 lbs. per acre. To work in with a rotation of crops, the following combination might be used: 4 lbs. timothy, 5 lbs. orchard grass, 7 lbs. red clover, and 2 lbs. of alsike clover, making 18 lbs. per acre. On fields that may be allowed to remain in permanent pasture for several years, Professor Zavitz recommends 4 lbs. meadow fescue, 3 lbs. tall oat grass, 2 lbs. timothy, 2 lbs. meadow foxtail, 5 lbs. alfalfa, 2 lbs. of alsike, 2 lbs. of white clover, a total of 24 lbs. per acre.

Alfalfa is a crop which dairy farmers should grow extensively. It is excellent for green fodder, pasture, hay, and for green manure. It should be cut for hay when about one-quarter in bloom. When well cured, a ton is almost equal to a ton of bran for milk production. Mixed with corn, it is very valuable for ensilage. Sow on a clean, fertile, well-drained soil, using plump seed of a hardy variety at the rate of 15 to 20 lbs. per acre. It may be seeded on fall grain in the spring, or with a light seeding of spring grain, or alone early in July on a moist summery fallow. Do not pasture or cut the first year.

Green peas and oats, or summer silage are also very valuable to supplement pastures. Summer silage is an excellent feed. It can be kept with very little loss, can be handled more cheaply than other crops, and may be covered with new silage, if necessary, and kept until wanted.

Where pasture is abundant, it seems doubtful if grain feeding pays, but where very short, from three to eight pounds of grain may be fed when the milk flow varies from 20 to 50 lbs. When a small amount of grain is fed while on pasture, corn is well adapted. When the grain ration exceeds five pounds per day, the grain mixture should be partly made up of bran, cottonseed meal, oats or gluten meal.

The great reason for the decrease in milk production during summer is that the cows do not get enough food. The excessive heat, and short pastures soon mean hungry cows, if no special provision is made to supply green feed in the hot months. Cows are better pastured in the late evening, during the night, and in the early morning.

Plenty of pure fresh water and clean salt are essential. From one to three ounces of salt per day should be fed, depending on the milk production.

WINTER FEEDING. In winter feeding we must recognize that the cow needs a certain amount of food to maintain the body. This amounts usually to from 50 to 60 per cent. of all she can consume and is called a

maintenance ration. Since she must be kept alive she should be fed the other 40 per cent. to 50 per cent. which would go entirely for milk production. The cow's nature calls for a very bulky ration, best supplied by corn silage. This, however, should be supplemented by alfalfa or clover hay, roots and meal. Alfalfa or red clover hay, if fed fairly liberally with silage makes a very satisfactory ration. Where good roughage is fed one pound of grain per day for each pound of butter fat produced per week is a fair guide. Timothy hay is not a satisfactory food. Too many men put their cows on short rations when not milking. A moderate amount of meal, provided you have no clover or alfalfa, fed while the cow is dry gives good returns later. With very heavy milkers there is some danger of losing them from "milk fever." Ordinarily, it is well not to milk the cow any more than is required for the calf during the first two or three days after calving. When a cow is attacked, the "air treatment" is effective.

TYPICAL AYRSHIRE.

The following are suggestions for daily rations for cows milking fairly well:—

1. Corn Silage	35 lbs.	2. Corn Silage	40 lbs.
Clover Hay	12 "	Alfalfa Hay	15 "
Wheat Bran	4 "	Corn (ground)	3 "
Oats (ground)	3 "		
3. Clover Hay	20 lbs.	4. Corn Silage	40 lbs.
Mangels	25 "	Clover Hay	10 "
Oats (ground)	3 "	Mangels	30 "
Corn (ground)	3 "	Wheat Bran	4 "
		Ground Oats	3 "
		Gluten Meal, Cottonseed Meal, or Oil Meal	1 lb.

The following table giving the digestive nutrients in one pound of some common feeding stuffs, is based on Bulletin 154 from Cornell Station:

Kind of Food	Total dry matter	Pounds of digestible nutrients			Nutritive Ratio
		Protein	Carbohydrates + (fat x 2.25)	Total	
Green fodder corn, 1 lb.	0.20	0.010	0.125	0.135	1:12.5
" peas and oats, "	0.16	0.018	0.076	0.094	1:4.2
" red clover, "	0.29	0.029	0.164	0.193	1:5.6
" alfalfa clover, "	0.28	0.039	0.138	0.177	1:3.5
Corn silage, "	0.21	0.009	0.129	0.138	1:14.3
Potatoes, "	0.21	0.009	0.165	0.174	1:18.3
Mangels, "	0.09	0.011	0.056	0.067	1:5.1
Sugar Beets, "	0.13	0.011	0.104	0.115	1:9.4
Carrots, "	0.11	0.008	0.082	0.090	1:10.3
Turnips, "	0.10	0.010	0.077	0.087	1:7.7
Timothy hay, "	0.87	0.028	0.465	0.493	1:16.6
Mixed hay, "	0.87	0.062	0.460	0.522	1:7.4
Red clover hay, "	0.85	0.068	0.396	0.464	1:5.8
Alfalfa hay, "	0.92	0.110	0.423	0.533	1:3.8
Corn fodder, "	0.58	0.025	0.373	0.398	1:14.9
Corn stover, "	0.60	0.017	0.340	0.357	1:19.9
Pea straw, "	0.86	0.043	0.341	0.384	1:7.9
Wheat straw, "	0.90	0.004	0.372	0.376	1:93
Oat straw, "	0.91	0.012	0.404	0.416	1:33.6
Corn, (grain) "	0.89	0.079	0.764	0.843	1:9.7
Wheat, " "	0.90	0.102	0.730	0.832	1:7.2
Rye, " "	0.88	0.099	0.700	0.499	1:7.1
Barley, " "	0.89	0.037	0.692	0.779	1:7.9
Oats, " "	0.89	0.092	0.568	0.660	1:6.2
Buckwheat, " "	0.87	0.077	0.533	0.610	1:6.9
Peas, " "	0.90	0.168	0.534	0.702	1:3.2
Corn and cob meal, "	0.85	0.044	0.665	0.709	1:15.1
Wheat bran, "	0.88	0.122	0.453	0.575	1:3.7
Wheat middlings, "	0.88	0.128	0.607	0.735	1:4.7
Low grade flour, "	0.88	0.082	0.647	0.729	1:7.9
Gluten feed, "	0.92	0.194	0.633	0.827	1:3.3
Gluten meal, "	0.92	0.258	0.656	0.914	1:2.5
Linseed meal (new process) 1 lb.	0.90	0.282	0.464	0.746	1:1.6
Cotton seed meal, "	0.92	0.372	0.444	0.816	1:1.2
Sugar beet pulp, "	0.10	0.006	0.073	0.079	1:12
Apple pomace, "	0.233	0.011	0.164	0.175	1:14.9
Skim-milk (separator), "	0.094	0.029	0.059	0.088	1:2
Buttermilk, "	0.10	0.039	0.065	0.104	1:1.7

To find the pounds of nutrients in any given number of pounds of any feeding-stuff multiply the weight of nutrients in one pound as given in the table, by the pounds fodder, meal, etc., which you expect to feed.

Two standards for feeding, a German and a Wisconsin have been worked out giving an approximate total of 24.5 lbs. of dry matter, and a nutritive ratio of about 1 to 6.6. The nutritive ratio refers to the amount of protein in relation to the carbohydrates and (fat. multiplied by 2.3).

By referring to the preceding table we find that ration No. 4 contains digestible material as follows:

Feeding Stuffs.	Total dry matter.	Pounds of digestible nutrients.			Nutritive ratio.
		Protein.	Carbo-hydrates. + (fat x 2.25.)	Total.	
Corn Silage, 40 lbs.....	8.40	0.360	5.160	5.520	.....
Clover hay, 10 "	8.50	0.680	3.960	4.640	....
Mangels, 30 "	2.70	0.330	1.680	2.010	. .....
Bran, 4 "	3.52	0.488	1.812	2.300	.....
Oats, 3 "	2.67	0.276	1.704	1.980	.....
Oil Cake, 1 "	0.90	0.282	0.464	0.746	. .....
	26.69	2.416	14.780	17.196	1:6.1
Wisconsin standard..... . .	24.5	2.20	14.900	17.100	1:6.8
German standard.....	24.0	2.50	13.400	15.900	1:5.4

By using the table as directed any farmer can readily find out the amount of digestible material in a ration and compare it with the standards given. If he finds that the ration is too low in protein or muscle forming material then bran, oil-meal, gluten meal, peas or clover hay should be added to the ration, and if necessary some of the more carbonaceous foods such as silage may be reduced. However, silage, roots, beet pulp, etc., give a succulency to the ration which is very important in the economical production of winter milk.

Cotton seed meal is probably our richest protein concentrate to-day and is a very valuable food for balancing up rations deficient in protein. Do not feed more than two or three pounds per day, especially to animals far advanced in the gestation period.

Have a regular time for feeding. While variety sometimes is alri ht, yet when a good ration has been chosen it should be followed carefully with very few changes. Silage and hay are best fed after milking.

PAYING PATRONS. Milk is valuable for buttermaking in proportion to the fat which it contains, and the pounds of fat delivered in the milk or cream should form the basis of dividing proceeds among patrons of the creameries.

As butter consists of fat, together with about 16 per cent. of water,

salt, and curdy matter, there will always be more butter than the fat contained in the milk or cream. This excess of butter over fat constitutes what is known as the "overrun." The "overrun" in whole milk creameries varies from 12 to 16 per cent., *i.e.*, 100 lbs. fat in the milk makes from 112 to 116 pounds of butter, and this "overrun" belongs to the patrons, unless otherwise understood. It is unwise for creamery managers to take this "overrun" as part payment for manufacturing.

In cream-gathering creameries the overrun usually varies from 15 to 20 per cent.

For calculating the yield of butter from fat in the milk, adding one-sixth to the fat is near enough for practical purposes.

Cheese is made largely from two constituents in the milk, viz., fat and casein; therefore, the method of dividing proceeds among the patrons of cheese factories is more complicated than for creameries. Three systems are now in use among factorymen:

1. Paying according to the weight of milk delivered regardless of its quality.

The principle of this plan is that it assumes all milk to be of equal value per 100 pounds for cheesemaking. It rests on a false assumption, is unjust, and it tends to promote dishonesty. Factorymen and honest patrons who complain that some of the milk is skimmed and watered by dishonest patrons, deserve little sympathy, because a remedy is within the reach of all at a very small cost. The milk of all patrons should be tested regularly, and be paid for according to its value for cheesemaking.

2. Paying according to the weight of the fat delivered in the milk, the same as at creameries.

The principle of this system is that it assumes all milk to be valuable for cheesemaking in proportion to the fat which it contains. The system is manifestly more just and equitable than the first named, and is to be commended in preference to "pooling" by weight of milk. The chief weakness of the plan is that the yield of cheese is not in direct proportion to the fat contained in the milk; therefore it gives an undue advantage to the patrons sending milk containing a high percentage of fat.

3. Paying according to the fat and casein in the milk, the casein being represented by the factor 2, added to the percentage of fat.

The principle of this system is that it assumes milk to be valuable for cheesemaking in proportion to the fat and casein contained in it and it further assumes that the percentage of fat + 2 represents the available fat and curdy compounds in milk for cheesemaking.

The application of the third system is very simple. To illustrate the tests for fat of patrons' milk are 3.0, 3.5, 3.8 and 4.0. The percentage of fat and casein are 3 + 2 = 5.0; 3.5 + 2 = 5.5; 3.8 + 2 = 5.8; and 4 + 2 = 6.0. The pounds of fat and casein are calculated by multiplying the pounds of milk delivered by the percentage of fat and casein. Thus, if the first patron had 1,500 lbs. milk he would h

credited with 1,500 × 5 ÷ 100 = 75 pounds of fat and casein. If the second delivered 2,000 pounds milk he would be credited with 2,000 × 5.5 ÷ 100, or 110 pounds of fat and casein, and so on with all the others. The value of one pound of fat and casein is ascertained by dividing the net proceeds of the sale of cheese by the total pounds of fat and casein delivered.

The following table gives a summary of the results obtained during five years' experiments, in which 250 experiments were made with nearly 200,000 pounds of milk, which contained percentages of fat varying from 2.7 to 5.5.

Av. p.c. fat in milk.	Lbs. cheese made per 100 lbs. milk.	Lbs. cheese made per 1 lb. fat in milk.	Lbs. cheese made per lb. fat and casein or p.c. fat +2.	Lbs. loss of fat and casein in whey.		Per cent. lost in curing in four weeks.	Average score.	
				Per 1,000 lbs. milk.	Per 100 lbs, cured cheese.		Flavor max. 35.	Total max. 100.
2.87	8.75	3.04	1.79	2.71	3.09	4.26	30.4	89.9
3.22	9.03	2.80	1.72	2.75	3.15	4.43	30.2	89.4
3.83	10.02	2.61	1.71	3.34	3.21	4.10	30.8	90.3
4.23	10.67	2.53	1.71	3.21	3.02	4.05	31.0	90.4
4.74	11.44	2.41	1.69	3.64*	3.18*	3.07	31.0	89.8
5.21	12.13	2.32	1.68	3.40*	2.80*	3.53	31.5	91.6

* Fat only. Casein not determined.

The Hart Casein Test has proven satisfactory, and enables us to obtain the percentage of casein in milk, but it does not change the principle of this third method.

SKIM-MILK AND WHEY. The value of skim-milk for young calves and pigs is much increased by feeding it sweet. The whole milk creamery should heat all skim-milk to 185 degrees, before it leaves the creamery. Sweet skim-milk is probably worth 15 to 20 cents per 100 pounds. It has also about the same value for grown pigs when sour, if fed along with meal.

Buttermilk has about the same value as sour skim-milk, if it does not contain too much water. When selling buttermilk in bulk at the creamery a convenient way is to value it at so much per ton of butter. From $5 to $8 per ton of butter is a fair price

Experiments made at the Ontario Agricultural College showed that 100 pounds of whey were equal to 14 pounds of meal in the production of bacon. Both skim-milk and whey had a marked influence in the production of firm bacon. When selling whey in bulk at the factory, it is usually valued at from five to ten dollars per ton of cheese

The by-products of cheesemaking and buttermaking are valuable factors in adding to the wealth of dairymen by means of feeding bacon hogs and young cattle for beef and the dairy.

All these by-products ought to be pasteurized at the factory before returning them to the farm. Whey heated to 160° F. for one hour in the whey tank will likely destroy the germs which produce tuberculosis in hogs and other animals. . All cheese factories ought to pasteurize the whey. It improves the feeding quality, lessens danger of spreading disease, and reduces danger from bad flavors in milk and cheese, as most of the organisms causing these flavors are killed by heating. The cost of pasteurizing the whey has been estimated at 50 cents to $1.00 per ton of cheese.

CARE OF MILK.

By Alex. McKay.

Milk is the raw material from which the cheese or butter maker manufactures a valuable and concentrated food product. It is a perishable article and very susceptible to contamination; it should be supplied only from cows in good health, furnished with an abundance of wholesome food, pure water and having free access to salt at all times. Cows giving milk should not be allowed to eat turnips, rape, foul weeds, brewers' grains, distillery slops, musty or decayed food, or anything that will impart an objectionable flavor to the products, as injury to the milk from any cause results in a positive loss to the producer. It is very important that there be no dust or bad odors in the stable at the time of milking. Before commencing to milk, the udder and flank of the cow should be brushed or wiped with a damp cloth to remove loose hairs or fine particles of dust or filth, as these are usually laden with undesirable germs. The milker should be clean, kind and sympathetic and free from any contagious diseases. Use only tin pails, being careful to see that all seams are well soldered, so as to facilitate cleaning. Wash and scald thoroughly all utensils used in handling milk. First rinse them with water, then wash well with water at a temperature of about 120° F., and then scald or steam. Do not wipe with a cloth, but place to drain where they will get plenty of sunlight and pure air. Use a brush in preference to a cloth for washing tinware. If these few simple rules are followed we should be able to produce milk in a fairly clean condition, and clean milk means milk with a comparatively low bacterial content. But, be as careful as we may, we find that we are unable to produce milk which is free from germ life, so the next step is to employ means of keeping this life in check. The only practicable way is to reduce the temperature so as to make unfavorable conditions for its development. The simplest and most effective way of doing this is to provide a tank large enough to contain cans that

will hold at least two milkings. Before commencing to milk, this tank should be filled with cold water into which the empty cans are placed, and as each cow is milked the milk should be strained into the cans. By handling the milk in this way the cooling is practically done as soon as the milking is completed. The milk should be covered up as soon as possible to prevent contamination from the surrounding atmosphere, and sufficient cold water added to the tank to reduce the temperature of the milk to at least 65° F., and for keeping it at that temperature over night. In keeping milk over Sunday, cool to 55° F. and hold at that temperature.

TANK FOR COOLING MILK AND HOISTING APPARATUS.

This tank may be so arranged that all the water pumped for watering stock may be run through it before it reaches the stock watering trough, thereby saving the labor of pumping this extra amount of water. Ice is almost a necessity for keeping Saturday night's or Sunday's milk. The warm milk should in no case be mixed with that already cooled. Where possible send to the factory in separate cans. If this is not done, the morning's milk should be cooled before mixing with the evening's milk. The whole secret of keeping milk in good condition is to be found in cleanliness and low temperature and under no conditions should chemicals be used for preserving milk.

"Lack of cleanliness and leaving the milk at high temperatures cause bad flavors and poor texture in cheese, and require more milk to make a pound of cheese."

BITTER MILK. There are two classes and two sources of bitter milk. The first has a bitter taste when freshly drawn. The second develops the bitterness only after standing some time, and it increases in intensity.

This is due to the growth of bacteria. When fresh milk is bitter it may be due to feeding of Swedes, cabbages or the eating of certain herbs. Again, certain cows develop a bitterness in their milk when far in the lactation period, and this usually occurs when the cow is receiving dry feed. When this occurs the grain ration should be reduced so that the cow will be receiving no more than is really needed for her production. It is said two or three doses of epsom salts at intervals of three days is effective in some cases in removing this condition.

Colored Milk. Red milk may be due to the work of bacteria. It usually results from the presence of blood in the milk. Some plants such as field horsetail, knot grass, sedges and rushes are said to give color to the milk. Where bloody milk occurs it is not necessarily due to any diseased condition of the cow. It is due to the rupture of a small blood vessel, allowing blood to escape into the milk cistern or ducts. It does not usually appear more than twice and cannot be stopped or prevented. Bloody milk should be rejected. Blue milk is caused by a bacillus, which enters the udder through the milk ducts.

Certain drugs are excreted through the milk, so that the use of certain medicines may give an abnormal odor, or flavor. Some of these are volatile oils, salts, rhubarb, arsenic, mercury, lead, zinc, iron, ammonia, and some acids. Poison ivy may produce such a condition of the milk that severe gastro-intestinal symptoms with weakness are felt by the consumer. Diarrhoea and abdominal pains may result after using milk from cows eating common artichoke leaves. Warts, chapped and otherwise sore teats may be greatly helped by using vaseline frequently.

HAND CREAM SEPARATORS.

By Geo. Travis.

At present there seems to be an unlimited market for sweet cream of good quality. Since cream is a perishable product, that cannot retain its good flavor for any definite length of time, it is necessary to adopt methods for creaming, most favorable for the production of the desired article.

Where milk is properly cared for at the farm, good cream can be produced for buttermaking by means of the shallow pans or deep setting system, but on account of the length of time required to produce cream by this method it is not practicable for the sweet cream trade.

The best known method for creaming at the farm is the hand centrifuge, more commonly known as the cream separator.

Some of the advantages of the cream separator over the old style gravity system are:

The milk may be put through the separator immediately after it has

been drawn from the cow, at which stage conditions for efficient creaming are most favorable, and the skim milk is then in the best condition for feeding purposes.

The richness of the cream may be regulated to the desired consistency by adjusting the cream screw. By this means it is possible to extract more of the milk serum from the cream, thus reducing the quantity to be cared for.

There are many other advantages which might be enumerated, such as: Less ice needed for cooling, fewer utensils to be washed, etc.

The chief objections to the hand separator are: the initial cost and the labor involved in turning and washing the machine, but when it is taken into consideration that the increased product made from the saving in loss of fat in the skim-milk over the best of other methods of creaming, these objections may be overlooked.

In choosing a separator it is advisable to select one with sufficient capacity for the amount of milk produced; one which is simple in construction, strong and durable with reasonable care, and one having all parts, which come in contact with the milk, easily washed. The manufacturers should guarantee that the machine will do good work, or no pay.

There are many different makes of separators on the market, but which is the best, it is impossible to say, as no one separator possesses all the points of merit that the ideal might possess. The best separator might be described as that best suited to the special conditions under which it is to be used. For example, the closest skimming separator may be more difficult to operate, or possess other disadvantages in its construction less desirable than a machine which skims less closely, and these disadvantages may more than counterbalance its closer skimming qualities. It would be a very poor separator indeed that did not have some good points, and it would be the ideal if it did not have some weak points. A hand separator may be considered as doing good work when, running at its full capacity, it will produce a cream testing from 30 to 40 per cent. fat, and not leave more than .05 per cent. fat in the skim-milk. To a certain extent the reputation of a separator as to its efficiency for creaming milk will depend upon the one who operates it.

With each separator is sent a book containing full directions for setting up, and operating the machine. These instructions should be strictly followed unless you know of something better, which you have proven to be so by practice.

Select a suitable place in which to locate the machine, where a pure atmosphere can at all times be assured. A well-built milk room in the barn that can be kept free from dust and stable odors, easily kept clean and tidy, may be most convenient, but it is advisable to have a separate milk house built in such a manner that it will be easily kept in a sanitary condition, with good ventilation and plenty of sunlight, not too far from where the cows are milked, so that the milk does not require to be carried to a great distance.

The foundation on which the machine is to be fastened must be solid, and the part of the frame which carries the bowl must be level every way. Before putting the different parts of the machine together each part should be thoroughly cleaned by using a cloth made damp with kerosene or gasoline.

After the machine has been properly put together, before starting, see that the oil cups are properly delivering the oil to each bearing. If at any time the bearings appear to be gummed, a little coal oil may be used with good results.

The number of revolutions required to give the proper speed is usually tabulated at the crank of the machine. Two or three minutes should be taken to get up full speed. The supply tank or feed pan should contain sufficient water, at a temperature of 110 degrees, to fill the bowl. This should be put through the machine first to warm the skimming device and prevent the milk from sticking. The milk then should be turned on full flow, and the supply pan kept well filled until the milk is all in. The speed should be kept as uniform as possible. If the separator is to yield cream of uniform richness, it must be given the same speed at each time of using. Unless the operator times himself by counting the revolutions of the crank per minute, or by the use of some other speed indicator, there will be a tendency to run the machine at too low a speed.

The "Metronome" is a very simple, inexpensive and practical device to time the speed of the separator. It works automatically and can be adjusted to mark time for any separator.

The rate of the inflow and the temperature of the milk will also cause a variation in the richness of the cream. The best practical temperature at which to separate the milk on the farm is from 90° to 100° F.

Milk is never in better condition for separation than immediately after it has been drawn from the cow. If the milk is allowed to cool, as is the case in winter, when the separator is used only once a day, or once in two days, the milk should be warmed to at least 90° F. before it is run through the separator, otherwise there will be a considerable variation in the cream test and also an increased loss of fat in the skim-milk. This increase in the richness of the cream and the excessive loss of fat in the skim milk, resulting from the separation of cold milk, will occur no matter what make of separator is used.

The practice of leaving the separator unwashed from time to time after using cannot be too strongly condemned. Only a clean separator can deliver cream that is pure, sweet, and of a desirable flavor, hence it is very important that all movable parts of the bowl should be taken apart and thoroughly cleansed after each separation. All remnants of milk, cream and slime should be washed off with tepid water, after which they should be scalded and left exposed to the sunlight if possible until required for further use.

After each separation, the can containing the cream should be set in cold water, and the cream cooled immediately to a temperature as low as possible. The cream should remain in the cool condition until it leaves

the farm. This will prevent souring in the summer and freezing in the winter.

When different lots of cream are to be mixed, the fresh cream should always be thoroughly cooled before it is put in with the old cream. Adding fresh, warm cream to cream that has been separated and held for some time causes the development of lactic acid, which if not properly controlled, will cause undesirable flavors in the cream and butter.

FARM BUTTERMAKING.

By Bella Millar.

A dairy instructor once said "Buttermaking begins in the stable but it does not end until the finished product reaches the table of the consumer." Realizing the truth of that statement, care should be exercised in every step of the work and the dairyman's watchword "Cleanliness" should be adopted.

In any line of work it is necessary to have good raw material in order to make a first-class article. In the manufacture of butter, if the raw material, the milk, does not receive proper care, the most skilful maker cannot produce the best quality of butter.

"Prevention is better than cure," thus every effort should be made to keep dust and dirt out of the milk pail. As soon as possible after milking, remove the milk from the stable and strain it through a strainer that is perfectly clean and sufficiently fine to prevent tiny particles being carried through.

CREAMING THE MILK.

Cream separators are very largely used in our farms to-day, and have many advantages over the gravity system of creaming milk. However, some still use shallow pans and deep cans for creaming purposes.

Shallow Pans. When using shallow pans, the milk should be strained into the pans as soon as possible after milking, and then be allowed to stand perfectly still in a pure air, free from draughts, at a temperature of about 50° to 60° F. for 24 to 48 hours.

Remove the cream while sweet by first loosening the cream from the pans by means of a thin bladed knife; then tip the pan and allow just enough skim milk to run over to wet the tin before gliding the layer of cream into the cream can.

Deep Setting System. The day is past for the use of the shallow pan system for creaming milk. If you have not a separator, then use the deep setting system. When using this method, the cans of milk should be placed in cold water and kept at a temperature of 45° F., or lower.

for 24 to 36 hours. By this system ice is required, unless the water be cold enough to cool the milk to, and maintain it at, 45° F. while creaming. If the cans are not provided with taps at the bottom, a cone-shaped dipper should be used for removing the cream. Loosen the cream from the can with a knife. Dip the skimmer in skim-milk or water, then lower it, point first, into the can, and allow the cream to flow evenly into it.

The loss of fat in the skim-milk by gravity creaming, even under the best conditions, is much greater than when centrifugal force by means of a cream separator, is applied.

Cream Separators.

The surroundings of a separator, as well as all its parts, should be kept clean.

Immediately after separating, the cream should be allowed to cool quickly to at least 55° before adding it to the cream can.

The cream should be of such a richness that from 3 to 3½ lbs. of butter can be made from one gallon of cream, or the cream should contain from 25 to 30 per cent. butter fat. This can be regulated by the screw on the separator bowl.

Taking a rich cream for buttermaking means less labor, lower churning temperatures, and less loss in the buttermilk.

With the best separators, well cared for, there will be a certain loss of fat in the skim milk. This loss, under good conditions, has been estimated at about $25.00 a year from a herd of 40 cows. This loss will be much larger when the separator is improperly handled.

The accompanying illustration shows the los proportionately and gives the money value of the fat left in the skim milk (from forty cows) under the following conditions. (1) Normal loss. (2) Loss when separator it washed only once per day. (3) Skimming milk too cold. (4) Bowl out of balance. (5) Separator turned too slow.

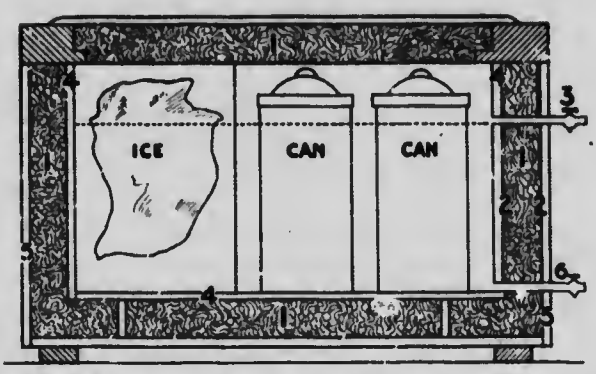
Care and Ripening of Cream.

The cream can should be large enough to hold the cream for one churning and should be provided with a cover.

A simple and cheap cream stirrer consists of a saucer shaped piece of tin about three inches in diameter with a long handle of heavy iron (tinned) fastened to the centre of it.

When collecting cream for a churning, care should be taken to keep it in a clean, cool place, and to stir it thoroughly from the bottom of the can every time fresh cream is added.

Tank for Cooling and Keeping Cream.



1—Mill Shavings 2—Two-ply damp-proof paper. 3—Overflow water-line. 4—Inner tank made of 1 inch lumber. 5—Outer shell of 1 inch lumber. 6—Bottom outlet.

The accompanying diagram illustrates an insulated tank for cooling and keeping cream. Provide an outer shell made of one-inch matched lumber, and tack on the inside thereof two ply of damp-proof paper.

Then make an inner tank (cooling tank proper) of a size to provide for a four inch space, at sides, ends and bottom, betwen outside of smaller tank and inside of larger shell. The cooling tank should be lined with galvanized iron so that it will be perfectly water-tight. Two ply of damp-proof paper should be tacked on the outside of this tank. The cooling tank should be about 22 inches deep, to hold shotgun cream cans 20 inches high. A couple of supports 4 inches high should be placed in the bottom of the larger tank, and mill shavings or dry sawdust packed in the bottom to a depth of 4 inches. Then place the cooling tank inside the larger one, and pack between the sides and ends with shavings or dry sawdust.

Have an outlet at the bottom and an overflow about 18 inches from the bottom. Make the tank large enough to hold the required number of cans 8 inches in diameter, allowing sufficient space for ice and water to keep them cold. A wire partition may be put in between the cans and the ice if desired. The lid should be of 1-inch tongued and grooved lumber, preferably insulated in the same way as the body of the tank. This saves ice. Such a tank is not affected to any extent by outside temperatures and will keep the cream cold and sweet.

A tank 22 inches by 40 inches, inside measurement, will hold 6 cans of cream. Tin cans (20 inches high and 8 inches in diameter) are better for keeping cream than crocks of any kind.

NATURAL RIPENING. In farm buttermaking cream is very often ripened naturally, that is, no "culture," or "starter" is added, but the lactic acid bacteria present in the cream are allowed to develop. This method may be used, if the flavor is satisfactory.

RIPENING BY USING CULTURES. By using a culture to assit in cream ripening, the buttermaker has more control of the flavor and is able to make a more uniform product.

A culture should be selected with care as the flavor developing in the cream will determine, to a large extent, the quality of the butter.

In Part I. on "Cheddar Cheese Making," full explanations are given for making a pasteurized skim milk culture. In farm dairy work some sour cream, sour skim-milk, or buttermilk may be used, if the flavor is alright. One method is to add one or two cups of culture to the cream can when beginning to collect cream for a churning. By doing this the sweet cream becomes inoculated with bacteria that will produce a desirable flavor.

Another method is to keep the cream sweet until twenty-four hours before churning, then heat it to 65° F. and add from one cup to one pint of culture for each gallon of cream. When the cream begins to thicken, cool it to churning temperature, or lower, and hold it at that temperature over night.

PASTEURIZE AND ADD CULTURE. This method of cream ripening is commonly used in creamery practice. By it we have the greatest control of the flavors, but more labor is involved.

Place the can of cream in a vessel of hot water on the stove. Bring the cream to a temperature of 160° to 165° F. Hold it at that temperature for twenty minutes, then cool rapidly to 60°, or 65°, and add a culture to ripen the cream.

Cream from cows that have been a long time in milk is sometimes difficult to churn and can be rendered churnable by means of pasteurization. Bad flavors are, to a certain extent, eliminated by this treatment.

Sometimes cream held at a low temperature develops a bitter flavor. The trouble may be kept in check by keeping the cream at a higher temperature to encourage the development of the lactic acid bacteria. which cause the souring; or, pasteurization may be resorted to.

Cream when ready for churning should have a pleasant acid taste and smell. It should be smooth and glossy and perfectly free from lumps. Cream should not be allowed to become overripe before churning. If for any reason a churning is put off for a day, the development of acid can be checked by lowering the temperature of the cream.

There will be an excessive loss of fat in the buttermilk if sweet cream is added to the ripened cream just before churning.

Although a mild flavored butter is in demand, only a limited amount of sweet cream butter is required for the Ontario markets at the present time. Those catering to this trade should cool the cream and churn at the temperature that will give an exhaustive churning.

CHURNING.

On many thermometers at 62° the word "Churning" is printed. If the manufacturers placed it there as a guide, many have mistaken it for a rule.

There is no standard temperature for churning, as conditions vary and many things should be taken into consideration; for example, low churning temperatures may be used when we have such conditions as rich cream, not too much in the churn, succulent feed, and cows fresh in milk.

Choose the temperature that will bring the butter in nice, firm granules in from 20 to 30 minutes.

A range of temperatures that will cover most farm conditions would be 54 to 58° F. in summer, and 56 to 64° in winter.

Always strain the cream into the churn, using a perforated tin strainer dipper. The small white specks sometimes seen in butter are caused by particles of curd which should not have been in the cream and would not have been in the churn if a strainer had been used. These particles injure both the appearance and keeping quality of the butter.

In farm dairies the barrel churn is used and having it about one-third full will make the work easier. A great many of the long churn-

ings are caused by having too much cream in the churn. Another cause of long churning is having the cream too cold. If after churning about thirty minutes, there is no sign of butter coming, raise the temperature of the cream a few degrees. Take the cream from the churn, place the can in a vessel of warm water and stir the cream until the required temperature is reached.

With very thin cream it is difficult to gather the butter and it may be necessary to draw off part of the buttermilk and continue the work, revolving the churn slowly.

If the butter breaks and will not gather, but remains about the size of clover seed, take the temperature of the contents of the churn, add a quart or two of water a few degrees warmer, revolve the churn a few times, let it stand a minute or two, then draw off part of the diluted buttermilk, and continue the churning.

If a rich cream thickens during the process of churning and concussion ceases, add enough water at the same temperature to dilute it so that it will drop again.

Difficult churnings are caused in a number of ways but can be avoided if a little thought is given to the question.

When the granules of butter are about one-half the size of wheat grains, add a couple of quarts of water several degrees colder and continue churning until the granules are the size of wheat grains, when the churning as a rule is completed.

If butter comes with the first drawn buttermilk, it is a sign that the churning is not quite completed. Give a few more turns to the churn.

Washing the Butter.

After drawing the buttermilk, rinse the butter with two or three quarts of water before putting on the wash water.

In winter, it is necessary to temper the wash water, taking into consideration the condition of the butter and the temperature of the room. Choose such a temperature that the butter will be in a nice condition for working.

Always put in plenty of water, revolve the churn quickly about a dozen times, then allow the wash water to drain. One wash water will be sufficient, if the water comes away clear, and the butter is firm.

Salting and Working the Butter.

Salt to suit the customer, or market, using a good dairy salt. Although some markets require three-fourths of an ounce to the pound of butter, others prefer less.

The butter may be salted on the worker or in the churn.

Salting on the Worker. The lever butter worker is inexpensive and suitable for farm dairy work. It consists of a V shaped table, simple in construction, and a pole or lever for pressing the butter.

Spread the butter evenly over the worker. Sift on the salt, fold over the butter, and work, by using only gentle pressue. Other methods, such as a sliding or cutting movement, injure the texture of the butter.

If the butter is too hard or too soft, give but a small amount of working, put the butter in a suitable place until it is of proper firmness, then finish the working.

The salt should be evenly distributed, otherwise the butter will be uneven in color.

Salting in the Churn.

Have the butter in an even layer over the bottom of the churn. Sift over it one-half the amount of salt required, tip the churn forward to cause the butter to lap over. Sift on some more of the salt, tip the churn backward to cause the butter to fall over, then add the remainder of the salt. Tip the churn back and forth a few times, then put on the lid, and give a few revolutions, very slowly.

If possible, allow the butter to stand for an hour or two before working. If this plan cannot be followed, it may be worked immediately. The amount of salt required can be estimated from previous churnings. Use a little more salt than when salting on the worker, as more drains off.

Printing and Packing Butter.

All butter packages should be put up neatly and attractively. The one pound brick print is the style most used. It is filled by pressing the printer down into the butter, then cutting off the surplus butter with a ladle.

The parchment paper should be of good quality, of proper size, and should be dipped in cold water before wrapping it on the butter.

Always weigh the first print, to make sure that you are dealing fairly with your customer and with yourself, before proceeding to print the rest of the churning.

On the average farm it requires more than one churning to fill a large butter package, therefore great care should be taken in order that the flavor, color, and salt shall be uniform throughout the tub, box or crock. Line tubs and boxes with heavy parchment paper. Crocks should be well glazed, having no breaks or cracks.

As large packages are often held for some time, endeavor to make the best quality of butter for packing. Pasteurizing the cream, washing the butter twice, salting a little heavier, and working the butter twice, are means that may be employed in the manufacture of butter for packing.

The place of storage is important, and should be clean, cool, and of even temperature.

Protect the packages in transit from the sun, dust, and rain.

The object should be to get the butter to the consumer in the best condition possible.

The Care of the Dairy Utensils.

Dairy tinware should be rinsed in luke warm water, then be washed in hot water containing a little washing soda, using a brush on both the inside and outside. Next, scald thoroughly with boiling water, and place where they will drain and dry. Sunshine and fresh air are beneficial.

The churn should be scalded with boiling water, then cooled with cold water before using. After using, remove particles of butter with hot water. Wash with hot water that contains a little washing soda, then scald with boiling water. Leave the lid off when not in use.

The butter worker, ladle, and printer should be scalded with hot water, scoured with salt, and cooled with cold water before using. After using, remove any butter with hot water, scour with salt, and scald with boiling water. Place the woodenware where it will dry, but do not put it in the sun, or it will warp and crack.

FARM DAIRY CHEESE.

Bella Miller.

The making of Cheddar Cheese is fully described in another part of this bulletin, but for farm dairy work a shorter and more simple process is desired. The following method will require about four hours time, thus enabling the maker to be through by noon.

For every ten pounds of cheese required, take 100 lbs. of milk, (10 gallons). The milk should be of good quality, clean and sweet, as it is impossible to make the cheese of any better quality than the milk from which it is made.

Take the fresh morning's milk and mix it with the night's milk in a vat, or some vessel suitable for holding milk; a clean wash boiler will answer the purpose. Heat the milk to 86°F. by placing a clean can of hot water in it, or by setting the vessel containing the milk on the stove and stirring until the desired temperature is reached.

If colored cheese is wanted, use one teaspoonful of cheese coloring for each 100 lbs. of milk. Add the coloring to a dipperful of milk and mix it thoroughly with the milk in the vat before adding the rennet.

Use one teaspoonful of rennet for every 25 lbs. of milk. Dilute the rennet with a pint of cold water and mix it thoroughly through the milk by stirring with a dipper for about three minutes.

Cover the vat until coagulation takes place, which will be in about twenty minutes, depending on the ripeness of the milk; the sweeter the milk, the longer the time required.

To ascertain when the curd is sufficiently coagulated for cutting, push the forefinger into the curd at an angle of 45°, until the thumb touches it, make a slight break in the curd with the thumb, then gently move the

finger forward. If the curd breaks clean across the finger without any flakes remaining on it, it is ready to be cut.

For cutting, regular curd knives are best. Use the horizontal knife first cutting lengthwise of the vat, then cut both lengthwise and crosswise with the perpendicular knife. This gives small cubes of even size.

When curd knives are not available, a long bladed knife may be used, cutting the curd lengthwise and crosswise of the vat in strips about one-third of an inch wide, then cut horizontally. By this method it is difficult to cut the curd evenly.

After the curd has been cut, it should be gently stirred with the hand, or with a small wooden rake for ten minutes before applying heat.

Heat the curd to 98°, taking about 30 minutes to do so. Continue stirring until the curd is ready for dipping; this is usually about 2¾ to 3 hours, from the time the vat was set.

When the curd becomes firm and springy and falls apart when a handful is pressed together, it is ready to have the whey removed.

The whey may be drawn off and the curd piled in one end of the vat, or the curd may be removed from the whey by means of a strainer dipper, spreading a large cheesecloth over a level butter worker and placing the curd on it to drain.

Stir the curd for 10 or 15 minutes, to allow the surplus whey to escape, before salting.

Sprinkle the salt over the curd, allowing one ounce of salt for every 25 lbs. of milk. Mix it thoroughly, and when the salt is dissolved the curd will be ready to put to press. Between 80° and 84° will be a suitable temperature to have the curd at this stage.

The cheese hoop, or hoops, should be made of heavy tin with two handles on the outside. A suitable size for home use would be 7 or 8 inches in diameter and 12 or 14 inches high. It is also necessary to have a wooden follower, which will fit nicely on the inside of the hoop.

Place a piece of cotton at the bottom of the hoop, as a temporary cap, then put the cheese cloth bandage inside the hoop. Carefully pack in the curd, fold over the end of the bandage, place on top a piece of cotton similar to the one at the bottom, then put on the wooden follower and put to press.

If a press with a screw is not available use a lever press. Take a piece of scantling 10 or 12 feet long for a lever. Place the cheese hoop on a strong box about three feet from the wall. Nail to the wall a piece of scantling, and under it put one end of the lever. Put a block of wood on top of the follower for the lever to rest on. A pail containing stones or iron may be used for the weight. Do not apply full pressure at first.

In three quarters of an hour the cheese may be taken from the press, the bandages wet with hot water, pulled up smoothly, and trimmed neatly, allowing one-half inch to lap at the ends. Cover the ends with circles of stiffened cheesecloth; over that place a piece of cotton dipped in hot water. Return the cheese to the press until the following morning, when they should be turned in the hoops and pressure continued a few hours longer.

After removing the cheese from the press, place them in a cool dry cellar to ripen.

Turn the cheese end for end on the shelf every day for a month and afterwards occasionally. These cheese will be ready for use in about 6 or 8 weeks.

To prevent the cheese moulding and to keep them from drying too much they may be dipped in hot melted paraffine wax. Another method to prevent mould is to put a double cloth on the cheese until ready for use. The mould will be on the extra cloth, leaving the cheese clean when it is removed.

SOFT CHEESE MAKING.

N. S. Golding.

In dealing with the subject of soft cheese making, only a general idea of the process can be given, as it has to be altered according to circumstances such as, variety of cheese to be made, the age of the milk, and the temperature of the room in which the cheese are manufactured.

The making of soft cheese is, practically speaking, new to this country, so that the taste for these cheese needs cultivating.

As these cheese will not keep for any length of time, being usually eaten in the fresh state, one must have a ready market for them.

The main object in soft cheese making is to retain in the cheese a high percentage of moisture, together with the fat which produces the soft texture, hence the name, "Soft" Cheese.

I shall describe how to make three kinds of soft cheese, namely, Camembert, Gervais, and Double Cream Cheese. Owing to the large number of different kinds of soft cheese, it would be impossible to describe all.

Camembert Cheese.

Apparatus Required:

½ pint bottle of rennet.
10 cc measuring cylinder (pipette).
1 Thermometer. 1 Dipper.
1 granite pail of convenient size to hold milk.
Straw mats, size 13 inches by 9 inches.
Boards 14 inches by 8 inches, ½ inch thick.
Moulds, small size, 4 inches high, 4 inches in diameter.
Moulds, large size, 5 inches high, 5 inches in diameter.

Process of Manufacture: Five pounds, or two quarts of new milk are required to make one large size, or two small size Camembert Cheese.

First add a small quantity of culture ("Starter"), if required. No culture is needed where good clean, sweet milk can be obtained. The milk is now regulated to a temperature of 86°F. and rennetted at the rate of 1 cc to 10 lbs. of milk, the rennet being diluted in ten times its volume of water, before adding to the milk. Stir the rennet in for five minutes and then stir over the surface with a wooden paddle for two minutes, as this prevents the cream from rising, which causes the cheese to break after they are made.

Cover the pail and leave till coagulation has taken place, which will be in about one hour. The correct stage is when the curd breaks easily over the finger.

Scald the required number of straw mats, boards, and moulds, then cool them in water. Place the boards on a drainer with the straw mats and moulds on top. Next ladle out with the dipper, a little curd into each mould, and repeat the same every twenty minutes, until all the curd is transferred and the moulds are full. In ladling the curd care should be taken not to break it, but obtain it in thin slices. When all the curd has been filled into the moulds, turn the cheese, by putting a straw mat and board on top and turning over.

Leave the cheese on the drainer till the whey has drained off and the cheese are firm enough to turn by hand. After turning, the cheese is left in the mould for six hours longer, when the mould can be removed, and in another six hours the cheese is ready to salt.

Salting is done by rubbing about ½ oz. of salt on the outside of each large cheese and ¼ oz. for the small size. After salting, the cheese are left on the straw mats for 12 hours, where further draining takes place. When the cheese is sold fresh, it is now ready to pack and send away.

NOTE.—The room in which the cheese are made should have a temperature from 62° to 70° F.

GERVAIS CREAM CHEESE

Apparatus required:

½ pint bottle rennet.
10 cc measuring cylinder (pipette).
1 Thermometer. 1 Dipper.
1 granite pail of convenient size, to hold milk and cream.
Moulds—2½ inches high by 2⅛ inches in diameter, in a group of six.
Straw mat and board as in Camembert Cheese.
Strips of blotting paper 2½ inches by 7½ inches.
Cloths made of duck material 27 inches square.

Process of Manufacture:

This dainty little cheese is made from a mixture of new milk and cream, the mixture being in the proportion of two parts milk to one of cream, testing 22% to 30% fat.

Take the required quantity of this mixture and bring to a temperature of 70° to 80° F., depending on the temperature of the room. Add the required quantity of culture,—no culture being needed where the milk and cream is sweet and clean. Rennet, at the rate of 1 cc to 10 lbs. of the mixture, is added, but first dilute the rennet in ten times its volume of cold water.

In about six to eight hours after the rennet has been added, the coagulation is firm enough to dip the curd with a dipper into the cloth, previously wet, which should be placed over a basin. The cloths should then be hung up by the four corners and left to drain.

After the curd has been draining for a few hours, open out the cloths and scrape down the sides to aid draining. Repeat the scraping at intervals of a few hours, until the cheese is firm enough to salt.

Turn the curd out of the cloths into a basin and salt at the rate of 1 oz. to 3 lbs. of curd. The salt, which should be fine dairy salt, must be worked in well with a spoon and the cheese left for a short time for the salt to dissolve before putting it into the moulds. The moulds should be lined with clean white blotting paper and placed on a scalded straw mat, or cloth, and the cheese pressed in with a bone spoon. The cheese may then be shaken out of the mould, wrapped, and sold.

NOTE.—Coloring may be done by adding cheese annatto, which somewhat improves the look of the cheese. Use about 1 cc coloring for each gallon of milk and cream.

DOUBLE CREAM CHEESE.

Apparatus required:

½ Pint bottle of Rennet.
½ Pint bottle Cheese Annatto.
Suitable pail for holding cream.
1 Thermometer. 1 Dipper.
10 cc measuring cylinder (pipette).
Moulds—size 2 inches by 3½ inches, 1¼ inches deep.
Cloths of duck material, size 27 inches square.
Butter muslin, grease-proof paper, boards and weights.

Process of Manufacture:

Take any quantity of cream testing about 22% fat. Make the cream at a temperature between 70° and 80°, depending on the room in which the cheese is to be set. When the cream is at the correct temperature, add the required quantity of culture, if the cream is likely to develop bad flavors. Cheese color may then be added if required. (About 1 cc of color to 10 lbs. of cream will usually give satisfaction.)

Rennet is next added at the rate of 3½ cc to 10 lbs. of cream, after diluting it in ten times its volume of cold water. Stir it into the cream.

In about six to eight hours, when the cream has thickened, ladle into dry cloths and hang up and put in a dry place. It is advisable not to put too much into one cloth, as it will be likely to develop too much acid before draining.

A few hours later open the cloths and scrape the sides to facilitate draining, then hang up again. Repeat the scraping at intervals of about three hours, until the curd is fairly firm. Then turn the curd out into butter muslin (used double thick), and salt the curd by adding 1 oz. of salt to every 3 lbs. and mixing it well into the curd. Fold the muslin over the curd, place on a board having another board and weight on top.

When the curd is ready to mould, it should be of a thick pasty consistency but not sticky. Line the tin mould with wax paper and press the cheese in with a knife or bone spoon, making the curd quite flat on top. Fold over the ends of the paper and shake the cheese out of the mould, they are then ready to be eaten; if kept, they should be put in a refrigerator or cold storage until used.

GENERAL NOTES.

The rennet and color are the same as are used in factory cheese-making.

10 lbs. of milk or cream=approximately, 1 gallon.

1 cc =20 drops.

3½ cc =1 dram.

As regards packing for shipment, we use ordinary rice paper to wrap the cheese in, and then place them in pasteboard boxes of proper size.

In our experimental work last summer the cheese gave good results when packed in glass jars, but they are rather expensive.

When keeping the above-mentioned soft cheese they should be kept in as cold and dry an atmosphere as possible, the best temperature being just above freezing. Camembert and Gervais will keep for about seven days at a temperature of about 50° F. to 55° F, while cream cheese will keep a day or two longer.

When marketing soft cheese, generally speaking, a good trade can be found in winter, but during the summer few retail men like to handle them, as they keep for such a very short time in hot weather.

MILK AND CREAM TESTING.

G. Rickwood.

It is necessary to test milk in order to ascertain its commercial value. The percentage of the different constituents of milk, especially fat and casein, will differ considerably in different milks, and for this reason we must have some means of knowing the extent of this variation. If the

milk is used for butter-making, then the fat of the milk will be in the index of its value, for it is the fat alone which is used for the manufacture of butter. In the manufacture of cheese, fat and casein are used, and in order to know the true value of milk for this purpose we must know the amount of fat and casein which the milk contains. It can readily be seen that a rapid, accurate, inexpensive and reliable test would be of inestimable value to the dairyman. For testing milk-fat, the Babcock has been found to give best results, and it is one of the necessary qualifications of a dairyman that he understand and be able to operate this test. It is rapid, in that it only takes a few minutes to make a test. Its accuracy has been vouched for by chemists who have made analysis of milk in order to compare results obtained by the Babcock Test. It is inexpensive, as the prices range from about $4 for a small sized hand machine to $25 or $30 for a large factory size machine. It is also reliable. Anyone with a little experience and using necessary precaution can obtain accurate results. The details necessary to consider in making a fat determination by the Babcock test are given briefly as follows:

1. Have the milk at a temperature of 60° to 70° F.

2. Mix the milk thoroughly by pouring it from one vessel to another, allowing it to run down the side of the vessel to prevent foaming. If the sample is not thoroughly mixed, a representative sample cannot be obtained.

3. With a 17.6 c.c. (cubic centimeter) pipette, measure this quantity of milk into a milk test bottle. To do this suck the milk into the pipette, and quickly place the forefinger over the top to prevent the milk running out. Allow the milk to drop out until the surface of the milk is level with the 17.6 c.c. mark, which is on the stem above the bulb. Now place the tip of the pipette into the top of the bottle and allow the milk to run out slowly by removing the forefinger.

4. Add to the milk in the bottle, 17.5 c.c. of commercial sulphuric acid at a temperature of 60° to 70° F, having a specific gravity of 1.82 to 1.83. Hold the bottle slanting and allow the acid to run down the side and under the milk. Use a graduate for this purpose. It is not a safe practice to use the pipette, as the acid may be drawn into the mouth, causing severe burning.

5. Mix the milk and acid thoroughly by giving a gentle rotary motion. Do not close the neck of the bottle while mixing.

6. Place the bottles in the machine, making sure they are properly balanced and whirl at full speed for five minutes. The speed is indicated on the machine. Do not exceed the speed so marked.

7. Add hot water at a temperature of 140° to 160° F., to float the fat into the neck of the bottle.

8. Whirl again for two minutes.

9. Remove the bottles from the tester and set in a water bath, which reached to the top of the fat, at a temperature of about 140° F., for a few minutes before taking the reading.

THEORY OF THE BABCOCK TEST.

A 17.6 c.c. pipette will deliver practically 17.5 c.c. of milk. 17.5 c.c. at an average specific gravity of 1.032=(17.5 x 1.032) 18.06 grams. 18 grams is the weight of milk required for a test. The volume of the neck of the milk test bottle between zero and 10 is 2 c.c. 2 c.c. of melted fat, at a specific gravity of .9=(2 x .9)=1.8 grams. The relation of 1.8 is to 18, as 1 is to 10, or 10 per cent. of the original volume of milk. This is why that weight or volume of milk is taken and why the neck of the bottle is divided into 10 equal parts.

NOTES.

1. Always make sure that the bottles and pipettes are clean before using.

2. Be careful to get the exact measurement of milk for the test.

3. If the milk is covered with thick cream, or is partially churned, it may be prepared for sampling by heating, then pouring from one vessel to another. Heating to 100° to 110° is sufficient for this. When it is thoroughly mixed, take the sample as quickly as possible and cool to about 60° F. before adding the acid.

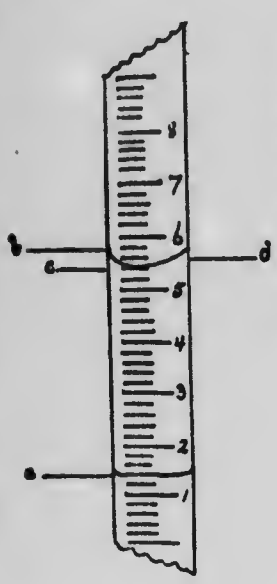
4. If the sample is frozen, warm both the frozen and liquid parts and mix thoroughly. Never test a sample immediately after being drawn from the cow. Allow to stand at least one hour.

5. If the milk is sour or thickened, it is necessary to add an alkali to dissolve the casein. A small amount of strong ammonia or concentrated lye will answer, stirring and mixing it well until the sample has become liquid again.

6. The quantity of acid must vary with its strength. If it is too strong use less, if too weak use more; but if the acid is very much too weak, or too strong, it should not be used. Weak acid is preferred to strong acid. Carboys or bottles containing acid should be stoppered with glass or earthenware stoppers, as the acid is very corrosive, and will burn or eat stoppers made of organic material or metals.

7. Avoid pouring the acid directly on the milk. After the acid is in the bottle there should be two distinct layers—milk on top and acid underneath, with no charred material in between. Do not allow it to remain long in this condition.

8. The water added to the test bottles should be soft or distilled. If hard water is used the addition of about 8 or 10 cubic centimeters of sulphuric acid to the gallon will soften . This will prevent foam above the fat.



9. It advisable to use a pair of dividers or compasses for measuring the fat column. The points should be placed at the upper and lower limits of the column to get the length, and then place one point at zero, and the position of the other point will show the percentage of fat in the sample tested. The accompanying illustration will show the correct method of reading milk tests when the fat is at 130° to 140° F. Correct reading A to B, not C or D. For cream, read from A to C.

10. Burnt or cloudy readings may be caused by:—

a. Having the temperature of the milk or acid too high.

b. Using acid which is too strong, or using too much acid.

c. Allowing acid to drop directly on and through the milk.

d. Allowing the milk and acid to stand too long before mixing.

11. Light or cloudy readings or floating particles of curd are usually caused by:—

a. Temperature of milk or acid too low.

b. Using too weak an acid, or not enough acid.

c. Careless mixing or insufficient shaking to unite the milk and acid thoroughly.

12. The accuracy of the test bottles and pipettes used in Canada is provided for in an Act of the Dominion Parliament known as the Milk Test Act, which requires that all bottles and pipettes shall be tested for accuracy of graduation by the Standards Branch, Department of Inland Revenue at Ottawa, and that each bottle and pipette shall be marked at the time of testing with the letters C. R. (or first letter of reigning sovereign) inside the crown.

13. Carefulness and exactness are absolutely essential in every detail if accurate results are obtained in milk testing.

14. Sulphuric acid weighs about 18 lbs. to the gallon, and costs 2½ to 4 cents per lb. A gallon will make 250 to 260 tests.

15. To find the correct average test of the milk from a herd of cows, find the total pounds of fat and total pounds of milk, multiply the pounds of fat by one hundred and divide by the pounds of milk. There is often considerable difference between the correct average test found in this way, and the test obtained by adding the different tests together and dividing by the number of cows tested.

CORRECT AVERAGE TEST.

Example:

Cow No. 1. 340 lbs. milk testing, 4.3%=14.62 lbs. fat.
Cow No. 2. 460 lbs. milk testing, 4.0%=18.40 lbs. fat.
Cow No. 3. 760 lbs. milk testing, 3.0%=22.80 lbs. fat.
Cow No. 4. 620 lbs. milk testing, 3.5%=21.70 lbs. fat.

Total... 2,180 lbs. milk. 77.52 lbs. fat.

If 2,180 lbs. milk contain 77.52 lbs. fat,
then 100 lbs. milk (per cent.=100) $\frac{100 \times 77.52}{2,180} = 3.55\%$.

INCORRECT AVERAGE TEST.

4.3 plus 4=3.0 plus 3.5=14.8 divided by number of cows=$\frac{14.8}{4}$=3.7%

Figure 1—4-bottle Hand Babcock Test Outfit.
" 2—Spring Balance.
" 3—Composite Sample Jar.
" 4—Sample Dipper.
" 5—Can Brush.
" 6—Cream-can Brush.
" 7—Tube or Sample-bottle Brush.
" 8—Tank for Cooling Milk.

Cream Testing.

The percentage of fat in cream can be obtained as easily and as accurately by the Babcock test as the percentage of fat in milk, and this is one reason why the oil test is being replaced by the Babcock test in cream-gathering creameries.

Cream test bottles, with specially graduated necks to contain 30, 40 or 50 per cent. of the quantity taken are used.

The same weight of cream as milk is necessary, namely, 18 grams, but since cream has a less specific gravity, or is lighter than milk, due to the larger proportion of fat, it is necessary to use more than 17.6 cubic centimeters. Sweet cream testing 25% fat has a specific gravity similar to that of water, so that if an 18 c.c. pipette is used and the pipettes are rinsed with a small quantity of water, the weight of the cream will be nearly 18 grams. Very rich cream, ripe, or gassy cream, or cream fresh from the separator, cannot be measured with an 18 c.c. pipette and have 18 grams in weight. It is, therefore, necessary to weigh such cream to get accurate samples. Several satisfactory cream scales are on the market. The Torsion, Fairbanks, and Philadelphia are classed among those giving satisfaction.

No definite amount of sulphuric acid can be given for testing cream, as some samples seem to require more than others in order to get satisfactory results, but as a rule less than 17.5 c.c. are required. A good guide is to notice the color of the mixture of cream and acid. It should be a dark chocolate color, but not black.

In milk testing the bottles are whirled for five minutes before adding the water, but in cream testing this is not practised, as it usually results in cloudy readings.

The usual method is to add hot water immediately after mixing the cream and acid and whirl for five minutes; or better still, add the water at two different times, filling up to the neck of the bottle and whirling four minutes, and then filling nearly to the top and whirling again for two minutes. The fat column should be a bright golden color.

Cream tests should be read at a temperature of 130° to 140° F., and the fat measured to the bottom of the meniscus or curve at the top of the column. Errors due to the expansion of fat amount to from one-half, to one per cent., if the reading is taken immediately after whirling in a steam tester.

SELECTING DAIRY COWS.

The following record sheets are suggestions of what might be used in keeping dairy records. These forms will be supplied free to those who apply to the Dairy Branch, Ontario Department of Agriculture, Toronto. On Form No. 2 can be kept the record of each cow for a number of years.

Record blanks and herd record books are furnished free upon application to Mr. J. A. Ruddick, Dairy Commissioner, Ottawa.

There is no method by which cows can be selected so well as by test. "It is quite practicable for individual farmers to test their own herds, but co-operation through cow-testing associations makes the work easier and cheaper, and at the same time more useful, inasmuch as each member of an association has the information relating to other herds as well as his own." There are now over two hundred cow-testing associations in the Dominion. Complete information regarding the organization and work of these can be obtained by addressing the Dairy Commissioner, Ottawa.

After the actual *weigh* and *test* method of selecting dairy cows, comes the selection by points. If a man has no records to follow, he must select by type and conformation.

There are five essential points to the make-up of any highly productive cow. These are constitution, capacity, nervous temperament, blood circulation, and ability to use her feed so as to yield the greatest amount of milk and butter-fat. *Constitution* is indicated by large nostrils, admitting a large supply of oxygen to the lungs for the purification of the blood. Great depth at the heart with a well sprung fore-rib is essential to a strong constitution. A cow, shallow in the chest and heart and with a poorly sprung rib, cannot give a good yield for any extended period, and she will tend to reproduce weaklings when bred. The dairy cow that is giving a heavy flow of milk produces several times more food for human consumption than a beef animal will do in the same time. When we consider that in this Province she is stabled for so many months, very often in poor quarters and exposed to various disease germs, it is easy to see that a strong constitution is essential.

Capacity is indicated by a large mouth, indicative of a good feeder, good length from the shoulders to the hooks, and with well sprung deep ribs, giving plenty of room for the handling of large quantities of food. Not only should the cow have room for plenty of food, but she should be able to thoroughly digest this food, for undigested food is worse than waste. This ability can only be determined by certain outward signs, such as quality of skin and hair. The skin should be soft and pliable, but not too thin, and the hair fine and silky. A heavy, hard, stiff skin, with harsh hair, indicates low power of digestibility and a tendency to unthriftiness.

Nervous temperament in a cow does not mean a high state of nervousness or irritability, but that the animal has nerves such as make the

various parts active, giving tone, vitality and activity to the many parts of the body. This important characteristic is judged by the size and character of her eye. Her face should be broad between the eyes and well disked. The eye should be prominent, bright, clear and mild, but not at all sluggish looking. The prominence and openness of the joints of the backbone is a very important indication. The backbone should be covered with no surplus flesh, for if it is, the cow is using to fatten herself that which should go into the milk pail. The ribs should be wide in themselves, and should have plenty of width between them. This

TYPICAL HOLSTEIN.

can be measured by inserting the fingers between the ribs. Persistency in chewing the cud is a very important point with dairy cows.

The *blood circulation* in the dairy cow, after absorbing the food, passes back to the hindquarters, down through the udder and on through the milk veins, entering the abdomen again through the milk wells. The escutcheon, or that part just above the rear of the udder where the hair grows upward or runs oppos[illegible]to that on other parts of the body, is supposed to be an indication of the production of the cow. The blood passing to the udder, it is thought, nourishes this, so that the length and spread of it is a measurement of the blood flow in this direction. A surer indication, however, is the size, length and crookedness of the milk veins, and the number and size of the milk wells. All cows have two

milk veins, a few have three. These veins should extend far forward, be large, and enter the abdomen through large wells. The size of the wells is one of the best indications of the producing power of a dry cow, as the veins are contracted at this period while the wells retain their normal size. The udder should be long, broad and of splendid quality. The texture of the udder is a most important point. When empty, it should hang in folds of soft, pliable, loose elastic skin. It should be full behind and attached high. If a plumb-bob is dropped from the pin bone it will fall just behind the udder, and one dropped from the hook bone will fall just in front. This development of the fore udder should receive special attention. The teats should be evenly placed, and be of good size. Incurving thighs are most favorable to the greatest udder development.

The extreme *angular form* approaching a wedge shape when viewed from in front, *i.e.*, narrow at the shoulders, on top of the shoulders, and broadening out toward the hindquarters and from the shoulders down, thus giving plenty of chest development, is an outstanding feature of dairy type. There should be a characteristic feminine appearance. The face should be lean and long, with a rather quiet expression, and the forehead broad, giving plenty of width between the eyes. The ears should be of fair size, fine in texture and with a yellow secretion inside. The neck should be fine, of medium length, with a clear throat and light dewlap. There should be no thickening of the neck, no crest on it, and no heaviness of the forequarters.

The bone should be of fair weight and of fine quality. It should have no appearance of weakness and yet should not be coarse.

The hooks and pin bones should be wide apart, and there should be plenty of length between them, with a marked falling away of the flesh on this part. The tail-head should be high. Some think this indicates vigor, but it seems more likely that this conformation finds its strongest point in that it should be unfavorable for the premature birth of calves.

A score card, as used at Farmers' Institute meetings and short courses, is appended. It can only be made use of in gaining some idea of the relative importance of the various parts of the animal. After this has been acquired the score card is not of great value.

Form No. 1

DAIRY HERD RECORD

Owner of Herd.....**Address**.....

Record for Month of.....

POUNDS OF MILK GIVEN DAILY

Date of Month	Time	NAMES OR NUMBERS OF COWS						% Fat	Total for Day
		1	2	3	4	5	etc.		
..... 1	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
..... 2	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
..... 3	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
..... 4	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
..... 5	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
..... 6	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
..... 7	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
..... 8	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
..... 9	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
.....10	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
.....11	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
.....12 etc.	A.M. P.M.	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	.....	.....	.....	.....	.....	.....	.....	.....	Total for Month .....

MILK SHEET.—A Form for keeping daily records of a dairy herd.

Regular full size forms are supplied by the Dairy Branch of the Provincial Department of Agriculture in the hope that many of the farmers will be induced to keep records of the amount of milk given daily by each cow. Many when they realize the advantages of such records will, no doubt, be induced to keep more complete records in accordance with the rules and regulations governing Cow Testing Associations. Give your local Dairy Instructor or District Representative the results of your record. Additional Sheets may be had by applying to Geo. A. Putnam, Director of Dairying, Department of Agriculture, Toronto, Ont.

Form No. 2

Permanent Record for Individual Cow

NAME .....

Herd No..... Registry No.....

SUMMARY OF MILK AND BUTTER PRODUCTION

For the Month of	1913			1914 etc.		
	Lbs. Milk.	% Fat.	Lbs. Fat.	Lbs. Milk.	% Fat.	Lbs. Fat.
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						
Yield for Period						
Number Days in Milk						
Record 365 Days						

SCORE CARD

FOR USE AT

FARMERS' INSTITUTE MEETINGS

(Same as used at Agricultural College, Guelph)

DAIRY CATTLE

SCALE OF POINTS	Possible Score	Students' Score	Corrected Score
A. **GENERAL APPEARANCE**: 16 points.			
Estimated Weight.....lbs.			
Form, wedge-shaped, as viewed from front and top; straight top line, and great depth of barrel	5	....	....
Quality, hair, soft and fine; skin, of medium thickness, mellow and elastic; secretion, yellow; bone, fine and clean	6	....	....
Style, active, vigorous, showing strong character; temperament, inclined to nervousness, but not irritable or vicious	5	....	....
B. **HEAD AND NECK**; 8 points.			
Muzzle, broad and clearly defined; mouth and nostrils large	1	....	....
Eyes, large, prominent, clear and placid	1	....	....
Face, lean and somewhat long, fine between muzzle and eyes	1	....	....
Forehead, broad	1	....	....
Ears, of fine texture, and medium size; secretion abundant	1	....	....
Neck, thin, rather long, fine and clean at junction with head; no noticeable amount of dewlap	3	....	....
C. **FOREQUARTERS**; 6 points.			
Withers, lean and sharp; vertebræ, somewhat higher than blades...	2	....	....
Shoulders, light, good distance through from point to point, but sharp on top; smoothly blended into body	2	....	....
Legs, well apart, straight and short; shank, fine and smooth	2	....	....
D. **BODY**; 22 points.			
Chest, deep, full between and back of fore-legs, no depression behind shoulder blade	6	....	....
Ribs, long, broad, and wide apart; well sprung, giving a large, deep barrel	10	....	....
Back, lean, straight and open-jointed; sharp chine and broad loin...	6	....	....
E. **HINDQUARTERS**; 13 points.			
Rocks, wide apart	2	....	....
Rump, long and wide	3	....	....
Pin Bones, high and wide apart	1	....	....
Thighs, thin	2	....	....
Legs, straight and set well apart; shank, fine and smooth	2	....	....
Escutcheon, spreading over thighs and extending far upwards	2	....	....
Tail, long and fine, terminating in a switch of fine hair	1	....	....
F. **MILK VESSELS, ETC.**; 35 points.			
Udder, long, wide, deep, but not pendulous, firmly attached, extending well up behind snd far forward; quarters, even and free from fleshiness	26	....	....
Teats, large uniform, and evenly placed	5	....	....
Milk Veins, large, long, crooked and branching	3	....	....
Milk Wells, large and numerous	2	....	....
Total	100	....	....

Name.....

Animal.....**Date**.....